D-21,357

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Serial No.: 10/600,605 Group Art Unit: 1745

Inventors: Christie et. al. Filed: 6/23/2003

Title: STORAGE SYSTEM AND METHOD FOR SUPPLYING HYDROGEN TO A POLYMER MEMBRANE FUEL CELL Examiner: R. Alejandro

DECLARATION UNDER RULE 132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

1. I, Dr. G. Maxwell Christie, the undersigned, make this declaration in support of a transverse of the rejection of the presently pending claims of the above identified patent application.

2. I reside and have a post office address at 103 Livingston Street, Buffalo, New York 14213, United States of America and am a citizen of the United Kingdom.

3. By way of background, I have about thirteen years of experience related to electrochemical separations that is principally in the field of ceramic oxygen ion separation devices such as solid oxide fuel cells. I also have experience in polymer electrolyte membranes and am quite familiar with the practical operation thereof. I have authored twenty seven publications and am a named inventor in several pending patents.

My educational background is as follows:

Doctor of Philosophy - Materials Science, Imperial College of Science Technology and Medicine, London University, United Kingdom -1994

Diploma of the Imperial College – Materials Science, Imperial College of Science, Technology and Medicine, London University, United Kingdom – 1994
Bachelor of Engineering with Honors, Class I, Ceramics Science and Engineering, The University of Leeds, United Kingdom - 1990

4. I am presently employed by Praxair, Inc., an owner of the assignee of the present application, as a Senior R&D Manager and am responsible for ceramic gas separation membrane technologies development.

5. I am one of the inventors of the above-identified patent application and as such am familiar with the specification as filed as well as the presently pending claims and matters that have arisen during the prosecution of the application.

6. In reviewing the official action mailed October 17, 2006, notice has been taken of the Examiner's position appearing in Paragraph 2., starting on Page 2, concerning the operation of fuel cells. In this section, the Examiner states several times that power is consumed during the maintenance operation and as such if the load is not powered, then the generated power is not drawn or outputted from the fuel cell system. At one point, the Examiner states that potentially, catastrophic or deleterious damages, not to say explosion can be caused by such system.

7. I disagree with the Examiner's position on this point and do not believe it to be correct. If a load of some sort were not placed on a fuel cell to at least complete an electric circuit, then the fuel cell would not operate and water would never be generated to hydrate the polymer electrolyte membrane. Consequently, if the fuel cell were not connected to some device or load, it would not work and there would be none of the dangers and deleterious effects claimed by the Examiner. This is

completely consistent with the claim in that the Examiner is missing the point that although the fuel cell may not be powering the load it was designed to power, it still can be powering a dummy load and this is exactly what can be done with fuel cells in remote locations that are functioning as uninterrupted power supplies.

8. In fact, the hydration of polymer electrolyte membranes needs to be maintained in order for fuel cells using the same to function. If the membrane is allowed to dehydrate, the conductivity of the electrolyte is significantly decreased. One method of maintaining the appropriate level of hydration in the electrolyte is to supply hydrogen to the anode and air to the cathode while loading the fuel cell. When the same is done, water will be produced in the cathode and in the simplest of cases, electro-osmotic drag can be relied upon to maintain appropriate levels of humidification as hydrogen protons move through the electrolyte when a load is applied to the fuel cell. This is known in the art as "exercising the membrane" and is done by running the fuel cell with a dummy load at a fraction of its generation capability. During this time, as set forth in the specification and claims, the fuel cell is not powering the "load" that it is designed to power at full power. The reason for this is that it is not necessary to apply the power to the load given the fact that the load itself is being powered by the conventional electrical power grid. However, since the membrane has been maintained in a hydrated condition, should the electrical power grid fail, the fuel cell can rapidly take over and power the load.

9. The maintenance operations described above are well known in the art and are hardly theoretical. In this regard, the present application arises from a requirement of a fuel cell manufacturer and user of such a fuel cell for an uninterrupted power application to provide sufficient hydrogen storage for up to twenty-four hours in the event of an outage. There was the additional known requirement that the fuel cell would be exercised as

part of routine preventative maintenance in accordance with a schedule in which the fuel cell would be powered up to a fractional part of its output power for a limited period of time and with the use of a dummy load. A remote monitoring system was installed such that performance characteristics of the fuel cell system could be verified on a monthly basis.

10. It is to be further noted, that the present application is not directed to the fuel cell itself or the known maintenance operation described above, but rather supplying hydrogen to a fuel cell for both load carrying and maintenance purposes. Consequently, since such operation of "exercising" a fuel cell is well known in the art, a person skilled in the art would be able to make and use the present invention as described in the specification and as set forth in the presently pending claims

11. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

G. Maxwell Christie

Dr. G. Maxwell Christie

March 26, 2007

Date